5/9/17 "If the wind will not serve, take the oars."-Latin Proverb

HW: "Vertical shifts of sinusoidal graphs" finish the packet
Test 2 on Thursday 5/18

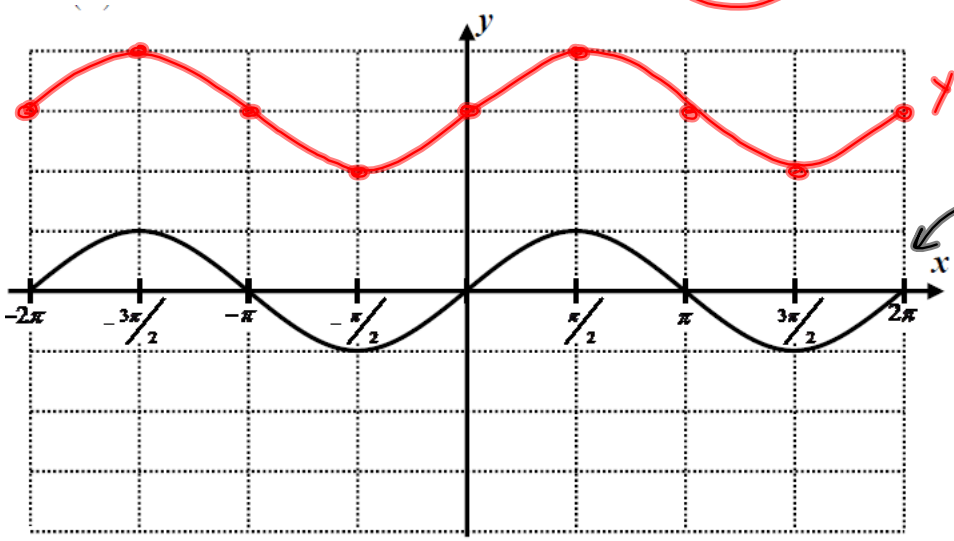
AIM: Vertical shifts of sinusoidal graphs

Warm Up: $\sin^2 + \cos^2 = 1$ (+ measures are the same in both)

If $\sin^2(32°) + \cos^2(M) = 1$, then M equals

1) 32° 2) 58° 3) 68° 4) 72°

***Exercise* #1:** Consider the function $f(x) = \sin(x) + 3$.



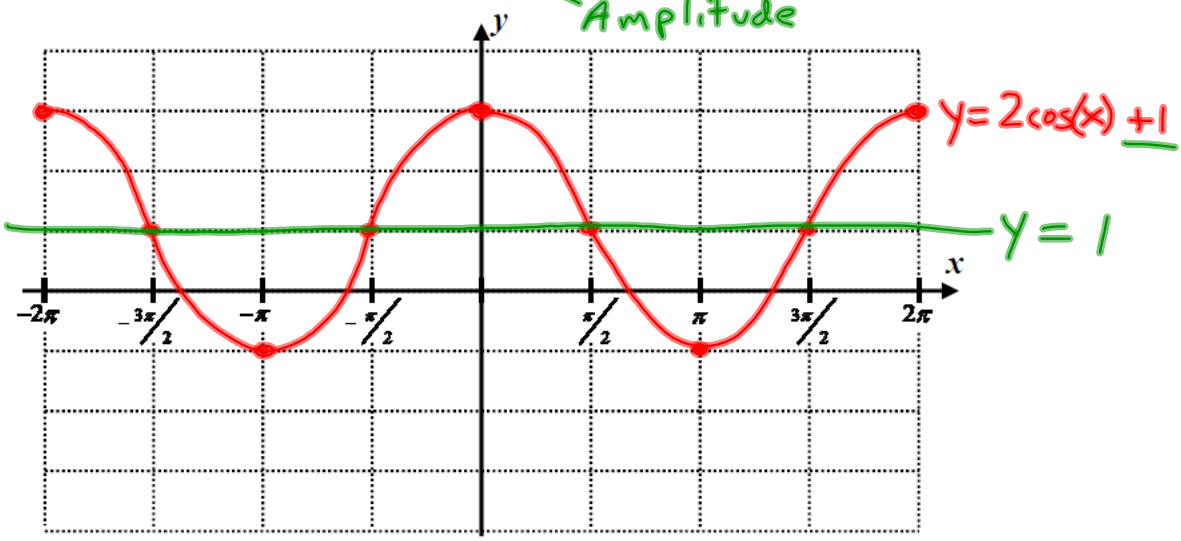
(a) How would the graph of $y = \sin(x)$ be shifted to produce the graph of $f(x)$? Shift up 3 units

(b) On the grid to the right is the basic sine curve, $y = \sin(x)$. On the same grid, sketch the graph of $f(x)$.

Exercise #2: Consider the function $y = 2\cos(x) + 1$.

up 1 unit

Amplitude



(a) Using your calculator, sketch the graph on the grid to the right.

(b) Give the equation of a horizontal line that this curve rises and falls two units above. Sketch this line on the graph.

$y = 1$

(c) State the range of this trigonometric function in interval notation.

$[-1, 3]$

For curves that have the general form $y = A\sin(x) + C$ and $y = A\cos(x) + C$ the value C is called the **midline** or **average value** of the trigonometric function. It is the height or horizontal line that the sinusoidal curve rises and falls above and below by a distance of $|A|$ (the amplitude).

Exercise #3: Sketch and label the functions $y = 4\sin(x) - 2$ and $y = -2\cos(x) + 3$ on the grid below. Try them first without your calculator and then use it to help or verify your graphs. Then, state the ranges of each of the equations in interval notation.

$y = 4\sin(x) - 2$ starts at origin

midline: $y = -2$

Amp = 4

lowest: $-2 - 4 = -6$

highest: $-2 + 4 = 2$

Range: $[-6, 2]$

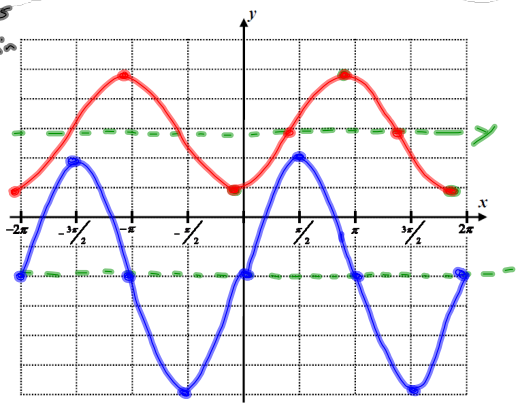
$y = -2\cos(x) + 3$

Amp: 2

midline: $y = 3$

lowest: $3 - 2 = 1$

highest $3 + 2 = 5$ start down below



Range of $y = 4\sin(x) - 2$:

$[-6, 2]$

Range of $y = -2\cos(x) + 3$:

$[1, 5]$

Exercise #4: Determine the range of each of the following trigonometric functions. Express your answer in interval notation.

(a) $y = 7\sin(x) + 4$

mid = 4

Amp = 7

low: $4 - 7 = -3$

high: $4 + 7 = 11$

$[-3, 11]$

(b) $y = 5\cos(x) + 2$ (Amp, mid)

low: $2 - 5 = -3$

high: $2 + 5 = 7$

$[-3, 7]$

(c) $y = 25\sin(x) + 35$ (Amp, mid)

low: $35 - 25 = 10$

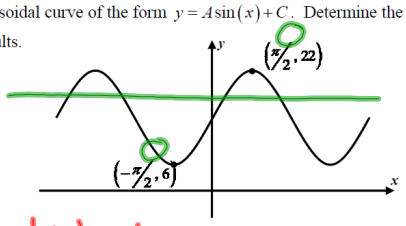
high: $35 + 25 = 60$

$[10, 60]$

Exercise #5: The graph below shows a sinusoidal curve of the form $y = A\sin(x) + C$. Determine the values of A and C. Show how you arrived at your results.

$C = \frac{\text{high} + \text{low}}{2} = \frac{22 + 6}{2}$

$C = 14$



$A = \frac{\text{high} - \text{low}}{2} = \frac{22 - 6}{2} = 8$

$A = 8$